

Defining the Relevant Common Picture



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Defining the Relevant Common Picture

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Abstract

This paper describes efforts by the US Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC) to define the Relevant Common Picture in support of the Battle Command Battle Lab (BCBL). One BCBL goal was to develop and deliver a relevant common picture of the battlefield for the division warfighting commander. The focus of the efforts was Advanced Warfighting Experiments (AWE) (completed in 1994), focused on identifying information requirements and potential components of the Battle Command Support System (BCSS). An earlier effort, Division Commander's Critical Information Requirements (CCIR) study (completed in 1985), which focused strictly on identifying CCIR, was also used. There seemed to be some overlap of the two efforts, the significance of which was diminished by time and changes across doctrine, organization, and materiel in the commander's warfighting force, from a 1985 Army of Excellence division to a hypothetical, 1998+ Mobile Strike Force (MSF) division. A hypothesis was developed that stated the Army has adequately determined the priority elements of information required to execute battle command. A second hypothesis was that there are several appropriate sample groups of the officer population (field grade and general officer level) to survey for this type of information. Further, it was believed that a certain core of information elements required to support successful battle command has been constant through history. To test these hypotheses, the study team compared both the perceived criticality of sixteen information types reported through questionnaires in the AWEs and the 83 information elements ranked in the CCIR study with the CCIR rankings from 1985. The team also compared the frequency of video-recorded observations of information usage with the perceived frequency of the usage to validate the use of perception-based data for analysis. The results of these comparisons, based on graphical, Pearson, and Spearman correlation analyses, are presented. These efforts set the course for future analysis to support the Army's efforts in Information Operations and development of Force XXI.

Background

The TRADOC Analysis Center (TRAC) Support to the Battle Command Battle Laboratory (BCBL) Advanced Warfighting Experiments (AWE) conducted in 1994, focused on identifying information requirements and potential components of the Battle Command Support System (BCSS). One BCBL goal was to develop and deliver a relevant common picture of the battlefield for the division warfighting commander. The objective for this part of the analytic support to the Battle Command Battle Lab (BCBL) was succinct:

- *To develop & deliver a relevant common picture of the battlefield for the division warfighting commander*

A definition of the common picture and relevant common picture is needed to frame the analysis. The common picture of the battlefield is the aggregate of data that is shared among all

friendly forces on the disposition of the friendly and enemy force. These data are used to build a tailored relevant graphic display for the warfighter that increases in detail shown as the echelon served is closer to the soldier. This is also termed situation(al) awareness. With a common picture of the battlefield, commanders and staff in the force will all have the same information at the same time. Digitization of the battlefield, the horizontal and vertical integration of friendly battle command and information systems, is an enabler of the common picture. The relevant common picture is a comprehensive view of the commander's battlespace, consisting of a graphical portrayal of enemy and friendly situation, commander selected status, and horizontal integration of the battlefield information systems. The emphasis is on selected, in that the relevant common picture is a slice of all that which is available to the force. The relevancy is related to and dictated by the situation and mission.

To meet this analytic objective, TRAC established the essential element of analysis (EEA) which causes a building of the RCP by identifying the elements of information the division commander requires to support his decisionmaking process. These elements can be supplied by various sources - commander's staff, subordinate, higher, adjacent, and other unit command and staff, intuition, etc. The analytic mission is tailored to developing the RCP for the division commander, although there may be differing RCP requirements through the force, depending on the echelon. The orientation is also on a maneuver commander, although functional area commanders may have varying requirements.

A prior effort, the Commander's Critical Information Requirements (CCIR) study was initiated by the Deputy Commander, Combined Arms Development Activity (CACDA) in 1984 and was completed in 1985. The study was performed by the C3I Directorate in CACDA with analytical assistance from CAORA, ARI, and the Joint C3 Department at the NPS. The study purpose was to identify and validate information needs of the Commander. It focused on identifying CCIR through the use of surveys and General Officer workshops (CCIR survey respondents included 1 O-6, 19 O-8's, and 6 O-9's). One result of the study was a prioritized listing of 83 information items (Force Level Information Requirements Plan). The top 25 were identified as sure inclusions to CCIR, while items 44 to 83 were determined to be sure exclusions to the CCIR. The study produced the first documented specification of a CCIR. The effort was based on Command and Control doctrine in effect at that time. There seemed to be some overlap of this study and the analytic objective to meet the BCBL goal, the significance of which was diminished by time and changes across doctrine, organization, and materiel in the commander's warfighting force, from a 1985 Army of Excellence division to a hypothetical, 1998+ Mobile Strike Force (MSF) division.

TWO STUDY EFFORTS

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|---|
| <ul style="list-style-type: none">• <i>Commander's Critical Information Requirements (CCIR) study</i> |
| <ul style="list-style-type: none">• <i>TRAC Support to BCBL AWE</i> |

Information Sources

The total informational base for this effort consisted of three (3) basic information sources:

► The TRAC-developed BCE student questionnaire was a significant part of the data base. The questionnaire was administered twice, during both January and March AWEs. Its purpose was to elicit student perceptions regarding various information types, and the total information system provided to them during the baseline experiment in January and during the "technology-insertion" experiment in March.

► Data Collector Observations - Direct observations were very important to the analytic effort. These observations were made in three types of events:

- The *AWE Exercises* (including January, March, April & the May Prairie Warrior).
- The *BCE Seminars* presented throughout the five months.
- *After-Action Reviews* conducted subsequent to the AWE exercises.

► Historical Information - Historical information provided a requisite background for the study team. This information included doctrinal literature on Battle Command and tactical decisionmaking, and a 1985 study on Commander's Critical Information Requirements (CCIR). As it turned out, the CCIR Study proved a significant source of data which caused enhancement of the data collection and analysis plan, and greatly enhanced the overall study results.

Data Element Sources

Various data elements were derived from the different information sources. The student questionnaires were probably the most significant source of data to determine the required elements of information for the RCP. The questionnaires elicited several characteristics from the students regarding 16 information types. These *information types* included Friendly and Enemy Location, Activity, Strength, LOG Status, Intent, Capabilities, and Equipment types. They also included terrain and weather. *Characteristics* addressed were adequacy, criticality, frequency of use, and timeliness. The perceived criticality and frequency of use of these information types were used directly to determine the elements of the RCP.

The March questionnaires also elicited a rank-ordering of information elements potentially comprising the RCP or CCIR. This occurred subsequent to the "technology insertion." Based upon the 1985 CCIR Study, the study team examined the same 83 information elements as that study. The students assessed them as sure inclusions, sure exclusions, or possible inclusions to a set of CCIR. The students limited the set to one comprised of about one-third of these elements.

From direct observation of the several previously mentioned events, data on information types, frequency of use, and entities involved in the information exchange were recorded. Direct observation data were recorded by data collectors as they were observed during the exercises. They were also recorded subsequently, while reviewing video recordings which were made of

command and staff cells during the exercises. It was possible to record many more data from review of the taped events, than it was from real-time observation, because of the pace of activity in the cells during the exercises.

As previously stated, historical information provided a requisite background for the study team. The doctrinal literature on Battle Command and tactical decisionmaking was absolutely necessary to an understanding of the baseline battle command system and the command and staff procedures implemented by CGSC students during the exercises.

The 1985 CCIR study provided a set of information elements to use as a "strawman" set of information elements to develop a core set of RCP elements. The study team kept the list of elements as described in the 1985 study, even though some of them were nebulous in meaning or seemingly not germane to our current environment. The team believed that this would be revealed by the students' rankings. This turned out to be the case. By not changing the set of elements the study team was able to perform statistical testing on the rank ordering of the elements in the two sets.

Hypotheses

The study team developed two major hypotheses regarding the analytic support effort. The primary hypothesis is that the Army has identified an adequate core set of information elements to comprise the Relevant Common Picture (RCP). The study team believed this for several reasons. *First*, the team was aware of a study completed in 1985 to develop essentially this type of information. *Second*, the team believed that the combat developments work over the years related to the development of an Army command and control system has always identified this type of element. *Third*, to model the various ATCCS systems, TRAC has identified doctrinally-required information elements related to each of the battlefield functional areas. It must be recognized that information technology is not equivalent to information. Regardless of rapidly evolving communications and computer systems, the information required for decisionmaking by Army commanders has been fairly stable from the earliest times (where is he?, what is he doing?, where are my forces?, what am I supposed to do?).

A second hypothesis is that there are several appropriate sample groups of the officer population (field grade and general officer level) to survey for this type of information. The CGSC Student population is, in fact, an appropriate sample of the Army Officer population to use to develop the RCP. This hypothesis is important for several reasons. *First*, the BCE students have begun to be used to support the Battle Lab in its efforts to investigate and advance the art of battle command. It is important that they are an appropriate group for this purpose. *Second*, their input was used to develop the RCP. *Third*, the study team relied on the CGSC population to perform command and staff functions in a doctrinally sound manner, so team observations had a strong basis. As long as Army leadership training is consistent between all levels and based upon a clear, commonly understood doctrine, this should be true. Further, the study team had noted that changes in Army leadership over time led to different personnel asking the same questions germane to the position they held without realizing that essentially the same questions had been previously asked and thoroughly researched.

A third hypothesis is that there are several most critical information elements to the division commander's RCP. This idea can be supported by the entire body of historical evidence, which shows that the satisfaction of a certain set of information requirements sets the conditions for battle success. Regarding the enemy force the commander needs to know where he is, what he's doing, and what he's going to do. With regard to his own forces, the commander needs to know where his units are, what they are doing, and what they (he) are supposed to do. This is not to say that situational awareness (of which these few elements are the essence) determines battle outcomes, but that it is a force multiplier which enhances the commander's chance of success with any given level of resources and mission requirements.

THREE HYPOTHESES

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| • <i>The Army has determined the priority elements of information required to support Battle Command</i> |
| • <i>There are several appropriate sample groups of the officer population to survey for this type of information</i> |
| • <i>There is a set of required core information elements which is historically based</i> |

Methodology

First, to test the stated hypotheses, the study team compared several sets of survey data. To do this, *first*, the team compared the BCE ranking of 83 information elements versus the General Officer CCIR study ranking of the same elements. *Second*, the study team compared the perceived frequency and actual frequency of information usage by the type of information. *Third*, the team compared the perceived criticality of the 16 information types and most nearly equivalent CCIR elements which we had derived from the list of 83.

► The primary two sets of data which were compared were the ranked 83 information elements from the 1985 CCIR study (Appendix A) and those elements as ranked by the BCE students. The statistical technique of Spearman rank correlation was used to test whether the two sets were significantly different. The purpose of this comparison was to determine if we have continued to identify the same set of priority information elements over time.

► The secondary data sets compared were the BCE students' perceived frequency of information usage by information type as recorded on questionnaires (Appendix B) and the actual frequency of information usage by type as observed by individual data collectors and also as video-recorded. The statistical technique of Pearson correlation was used to test whether the two sets were significantly different. The purpose of this comparison was to determine if the students' perceptions were different than reality. The lack of statistical difference in the sets would help to validate the usage of their perceptions regarding the criticality of information types and the ranking of CCIR elements. The secondary dataset comparison was also made graphically prior to performing the statistical analyses and indicated that there was reason to proceed with the statistical testing.

► The tertiary data sets which were compared were those of the perceived criticality of sixteen information types reported through questionnaires given to the BCE students in the AWEs and the ranks of CCIR elements mapped against them (Appendix C). The statistical technique of Spearman rank correlation was again used to test whether the sets were significantly different. The purpose of this comparison was also to determine if the Army has continued to identify the same set of priority information elements over time. The results of all the statistical comparisons are presented in Appendix D.

THREE DATASET COMPARISONS

• <i>The Ranked 83 Information Elements</i>
• <i>The Perceived and Actual Frequency of Information Usage by Information Type</i>
• <i>The Perceived Criticality of Sixteen Information Types and the Ranked Equivalent CCIR Elements</i>

Next, the study team determined the common and core elements required for the RCP. This was accomplished by merging the ranked information elements, setting a limit of 25 elements as the number for a core set. The identification of the top 25 in each set would most likely result in some elements common to the top 25 of both sets, some elements which would occur in the top 25 of the BCE ranking, and some which would be found only in the top 25 of the CCIR ranking. Further, the team allowed for insertion of additional elements from data collector observation - of AWEs, AARs, and seminars. This was to provide additional objectivity to the process.

Finally, the information element set was validated. This was accomplished by re-examining the set of elements identified for the relevant common picture and ensuring that each element had a doctrinal basis.

Statistical Results

The study team analyzed the BCE ranking and the General Officer CCIR ranking of information elements by using the statistical technique of *Spearman rank correlation*. This technique examines the correlation between the rank orderings of elements comprising two datasets. The Spearman statistic considers the relative rank of each of the 83 elements in one set versus the other. In this case the correlation between the two sets was highly significant (99 % confidence level). Alternatively stated, there was no statistical difference between the rank ordering of the elements. Thus, the BCE students' CCIR set is the same as the division and corps commanders' set. These statistics are presented in Appendix D.

The analysis of the frequency of usage datasets revealed that the CGSC BCE students had a perception closely correlated with reality (actual events during the AWEs). The correlation was statistically significant at the 95 percent level between both the data collector observations and the video-recorded observations, and the students' perception. The statistics are presented in Appendix D. Furthermore, the correlation between the data collector observations and actual

video-recorded frequencies of information usage was very high (significant at the 99 percent level). This was reassuring with regard to the method of on-site data collection employed during the experiments.

The testing also showed that there is no significant difference between the rank ordering of the sixteen information types. The results were significant at the 99 percent level between the mapped CCIR elements and the January survey results and were significant at the 87 percent level using the March survey results. The drop in correlation within these sets, and between these and the 83 elements is probably because of the fewer elements ranked, the mapping of equivalent CCIR elements to information types which had to be done, and the lower resolution (or larger amount) of information represented by each type.

MAJOR STATISTICAL RESULTS

<ul style="list-style-type: none">• <i>Two Sets of Ranked 83 Information Elements the Same - Significant at 99 Percent Level</i>
<ul style="list-style-type: none">• <i>The Perceived and Actual Frequency of Information Usage by Information Type Highly Correlated - Significant at 99 Percent Level</i>
<ul style="list-style-type: none">• <i>The Perceived Criticality of Sixteen Information Types and the Ranked Equivalent CCIR Elements Correlated - Significant at 87 Percent Level</i>

Interpretation

The basic result of the examination of perceived and actual frequency of information usage by information type was that the students' perceptions of reality were highly accurate. Thus, they were appropriate to use for perceptions of criticality of information types, and for their perceptions of the elements required to support the division commander's decisionmaking. TRAC believes the BCE and larger CGSC student groups to be a valid sample of the Army officer population to survey for their perceptions regarding criticality of information types, from the point of view that their perception of the experiment events is very accurate. Furthermore, they demonstrated throughout the AWEs that they have a good knowledge of battle command doctrine and the decisionmaking process germane to the division level. Correlation with the CCIR Study rankings also helps to validate the use of the sample group for the purpose of defining the relevant common picture. The major difference between the field grade and general officer groups is not the knowledge of what to do, but the experience of doing it which facilitates and quickens decisionmaking.

To examine the equivalence of the information element rankings in a more intuitive way, the commonality of elements between the two sets was examined. That is, the team examined how many information elements in the BCE top 10, 16, and 21 elements occurred in the top 10, 16, and 21 of the CCIR study. This commonality reflected the strength of the Spearman statistic, with 5 of 10, 11 of 16, and 17 of the top 21 elements common to the two sets. The study team found the 18 elements shown in Appendix E were *common* to the top 26 elements of both the

BCE student and General Officer rankings of the 83 candidate information elements. The team drew a cut line at 26 because of a tie for the 25th in the BCE set. TRAC feels strongly that this result (the significant commonality) validates the use of the information elements identified by these sets as a core for the division commander's RCP. The fact that the two sets (BCE and CCIR Study) were highly correlated did not validate the accuracy of either set, although the General Officer survey should have a certain degree of validity attached to it.

COMMON ELEMENTS

• <i>Five of Top Ten of 83 Information Elements the Same</i>
• <i>Eleven of Top Sixteen of Elements the Same</i>
• <i>Seventeen of Top 21 Elements the Same</i>

There is a strong parallel between the aforementioned elements and the information types rated important to essential, discussed later. Several of these elements address friendly intent directly - command/G2 guidance, command mission, and concept. The study team observed during all the exercises that the synchronization of all subordinates' understanding of the commander's intent was the most critical of planning activities. If there was any lack of understanding of intent, it always adversely affected either mission planning or execution.

Enemy location is addressed by the element enemy situation/assessment. Enemy intent is addressed by enemy mission/objective. Enemy activity is addressed by the requirement for the intelligence summary and the enemy activity elements.

Critical terrain is notable as a highly ranked information element requirement. It is a fundamental mapping element, and mapping is fundamental to battle command. There is a strong relationship between critical terrain and area of operations, avenues of approach, and axis of advance.

The *other elements* in the top 26 of the BCE ranking are shown in Appendix E. These did not rank in the top 25 of the General Officer ranking, but most were ranked in the top half of the their set. Note that physical features of the battlefield were important to the BCE students.

The elements which did not make the top 26 elements in the BCE ranking, but were in the top 25 elements of the General Officer CCIR ranking are also shown. The shift away from nuclear operations between these surveys is evidenced by the two elements which appear in this list. The importance of considering each of these groups of elements for the RCP is highly evident in this group. Nuclear-related elements can certainly become the highest priority in given situations, and the battle command support system must support them. Also in this group is the element for EW and OPSEC assessment. Information operations doctrine will cause commanders to need information to effectively integrate the areas of EW, OPSEC, deception, and PSYOP to exploit information on the battlefield. The BCE students were not operating under this doctrine, which is presently being developed. The core set provides a prioritized list of information elements to both protect and disrupt within the two-sided context of army information operations.

From study team observations of the events previously mentioned, elements showing merit for strong consideration for inclusion into the set of elements for the RCP were found. Rather than information elements themselves, these found were essentially display capabilities supportive of the previously discussed information elements. The first capability is related to the visual display of the range component of systems. These systems include sensors, and direct and indirect fire weapons. Range fans for all Army capabilities which have a range component will enhance the commander's tactical decisionmaking. Automated range fan displays will increase the staff's responsiveness to support the commander's needs. These will also likely decrease the commander's decision cycle time, as more complete information is presented graphically. There needs to be a 3D capability to the range fan displays. The second capability is related to the dynamic display of the location of entities. These entities include both friendly and enemy units and systems, on the ground and in the air. One of the needs most cited by the BCE students in the various exercises was for dynamic display or tracking, essentially to support trend analysis, which they attempted with discrete data as best they could in each exercise.

TWO ADDITIONAL ELEMENTS

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|---|
| • <i>Range Fan Displays</i> |
| • <i>Dynamic Location Displays</i> |

To take full advantage of data from the student questionnaire, correlations between the perceived criticality of the 16 information types and equivalent (as we determined) CCIR elements were examined. As previously stated, there was a high correlation between them for both the January and March responses. This provided further evidence that the students' responses were consistent regarding criticality, and hence, lends further credibility to their rankings of information elements.

The *friendly and enemy* information types rated as *important to essential* (the highest two ratings (4 or 5 on a 1 to 5 scale)) by the BCE students included location, intent, and activity. The *friendly types* also included the additional strength and capabilities. Friendly location and intent, and enemy location were notably higher than the other types in both the January and March survey responses. Both *geophysical types*, terrain and weather, were rated important. Weather actually did not average the important rating in January and barely did in March, but the study team viewed the "technology-insertion" experiment as the more important context for the responses.

Summary

To summarize the study team found the following:

- ♦ The BCE and General Officer rankings of information elements comprising a set of CCIR were statistically identical.

- ♦ The students' perception of the frequency of usage of information types, and data collector and video-recorded observations of the frequency of usage were identical.
- ♦ The criticality of 16 information types reported by the students was identical to equivalent CCIR elements which they ranked.
- ♦ A core set of information elements to comprise the RCP.
- ♦ The set of RCP information elements is tailorable and should be tailored based upon the situation.
- ♦ The set of information elements to comprise the RCP is consistent with Army doctrine and is validated.

The study team also concluded that the most critical information elements which were identified continue, as has been the case historically, *to tell the commander*:

- ▶ Where the enemy is
- ▶ What the enemy's doing
- ▶ What the enemy's going to do

- ▶ Where the Blue units are
- ▶ What Blue units are doing
- ▶ What the commander is supposed to do

Recommendations

The following recommendations are based on the observations and analysis made during TRAC's support to the Battle Lab for the 1994 AWEs.

- ♦ The major recommendation is to use the information elements identified in this paper as the core of the division commander's Relevant Common Picture. There are several parts to this recommendation.

- *First*, TRAC is most strongly committed to the use of the elements common to the BCE and General Officer-identified CCIR as the central core of the RCP. The requirement for these elements to support Battle Command is essentially inflexible.

- *Second*, the elements ranked in the top 25 or 26 by the two groups which were not common to both sets should always be considered for inclusion. These two groups of information elements could be used more flexibly to build the RCP in various situations. As an example, nuclear-related elements may not be needed in the Latin American Theater, but may be

part of the 2nd Division Commander's RCP in Korea (radiation dose status will probably elevate in importance in conflict regions where reactors are present).

▪ *Third*, the study team observed a recurring need for several additional elements (or information display capabilities) which support the core RCP. These are range fan and dynamic display capabilities. There are several doctrinal implications in this finding. First, the core elements of the division relevant common picture has been well established. The set of elements for both CCIR and the relevant common picture should be modified, not re-done, over time.

♦ The second recommendation is to continue to modify and enhance the set of information elements over time, but do not re-do the work. The core elements the set must contain have been validated. The important part of the issue now is the optimal display of the RCP. The tailorability of the RCP is a concept which must be stressed, along with the fact that there is a timeless, core set of elements which is germane to the full range of military operations.

♦ The third recommendation is to continue to use the student population of the Command and General Staff Course to help to develop and to evaluate Battle Command Doctrine. The study team observed, supported statistically, and documented that the students, especially in the BCE, are appropriate for this work. The data supporting this finding is also supportive of the fact that our Army educational system is focused and integrated, and that our mid and high-level leadership is synchronized in the approach to Battle Command and Army tactical decisionmaking.

RECOMMENDATIONS

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| ► <i>Use the BCE CCIR as a Set of Core Common Division CCIR</i> |
| ► <i>Modify and Enhance the Set Over Time - Do Not Re-Do</i> |
| ► <i>Use the CGSC Student Population to Develop and Evaluate Battle Command Doctrine</i> |

APPENDIX A.

Survey List of CCIR Information Elements

#	Information Element	Sure Inclusions to Set	Possible Inclusion to Set	Sure Exclusion to Set
1	AirCRAFT Allocations / Priorities			
2	AirCRAFT Requirements			
3	Adjacent Unit			
4	Atomic Demolition Munitions (#, Type, Loc)			
5	AD Suppression Requirement (SEAD)			
6	Airspace Report (Friendly)			
7	Airfields (Location, Type, Condition)			
8	Airhead Location			
9	Airspace Coordination Area			
10	Airspace Restrictions			
11	Area of Operations			
12	Assembly Area Location			
13	Assessment (EW & OPSEC)			
14	Assets Available			
15	Artillery Target Report			
16	Available Supply Rate			
17	Avenues of Approach			
18	Axis of Advance			
19	Basic Load Percent Fill (by Type)			
20	Battle Losses (Equip)			
21	Battlefield Geometry (Boundaries)			
22	Bomb Damage Assessment			
23	Bridging (Location, Type, Condition)			
24	Call For Fire			
25	Casualty Report			
26	Check Fire			
27	Command Mission			
28	CMD/G2 Guidance (PIR)			
29	Command Controlled Items			
30	Concept (Scheme of Maneuver)			
31	CONOPS (Tac, Main, Rear)			

#	Information Element	Sure Inclusions to Set	Possible Inclusion to Set	Sure Exclusion to Set
32	Constraints (By Area or Resources)			
33	Coordinating Instructions			
34	Critical Personnel Shortages by MOS			
35	Critical Situation Alert			
36	Critical Terrain (Location/Description)			
37	ECM/ECCM Report			
38	EEFI Friendly Vulnerabilities			
39	Enemy Activity			
40	Enemy Aircraft			
41	Enemy Mission/Objective			
42	Enemy Situation/Assessment			
43	Enemy Weapon Systems			
44	Engineer Support Required			
45	EW Tasking			
46	Free Text			
47	Friendly Activity			
48	Friendly Unit Information			
49	Graphic Message			
50	Immediate Engagement Target			
51	Intelligence Summary			
52	Interference			
53	Minefields (Location, type, #)			
54	Mission Fired Report			
55	Movement Table Listing			
56	NBC Support			
57	Obstacles/Barriers			
58	Order of Battle			
59	Planned Targets			
60	POL locations			
61	Priorities for ADA			
62	Priority of Issue			
63	Priority of Support to Combat Elements			
64	Query			

#	Information Element	Sure Inclusions to Set	Possible Inclusion to Set	Sure Exclusion to Set
65	Radiation Dose Status			
66	Railways			
67	Release Policy (Nuclear)			
68	Replacement Priorities			
69	Report Request			
70	Required Supply Rate (RDs by Type)			
71	Roads (Location, Type, Condition)			
72	Routes (Condition, Availability)			
73	Serious Incidents			
74	Situation Report (SITREP)			
75	Sorties (#, Type)			
76	Special Operations			
77	Strike Warning			
78	Supply Shortages (By Class)			
79	Target Criteria			
80	Target Request			
81	Task Organization			
82	Terrain (Avenues, Concealment, Mobility)			
83	Weather Data			

APPENDIX B.
Information Types

Information Types		
<i>Enemy</i>	<i>Friendly</i>	<i>Physical</i>
Location	Location	Weather
Activity	Activity	Terrain
Strength	Strength	
Logistics Status	Logistics Status	
Intent	Intent	
Capabilities	Capabilities	
Equipment Types	Equipment Types	

APPENDIX C.

Information Types

(CCIR - BCE Mapping)

Information Types	
CCIR Mapped Element	BCE Information Element
Friendly Activity	Friendly Location
Friendly Activity	Friendly Activity
Friendly Unit Information	Friendly Strength
Supply Shortages (By Class)	Friendly Logistics Status
Command Mission	Friendly Intent
Assets Available	Friendly Capabilities
Friendly Unit Information	Friendly Equipment Types
Intelligence Summary	Enemy Location
Enemy Activity	Enemy Activity
Enemy Situation/Assessment	Enemy Strength
Intelligence Summary	Enemy Logistics Status
Enemy Mission/Objective	Enemy Intent
Intelligence Summary	Enemy Capabilities
Enemy Weapon Systems	Enemy Equipment Types
Weather Data	Weather
Critical Terrain	Terrain

APPENDIX D.

Data and Statistical Results

Ranking Statistics

Group 1	Group 2	Spearman ρ p values	
CCIR Study Ranking (83 Information Elements)	BCBL AWE Ranking (83 Information Elements)	0.679	0
CCIR Study Ranking (16 Equivalent Information Elements)	BCBL AWE Ranking (16 Information Types) - January	0.655	0.006
CCIR Study Ranking (16 Equivalent Information Elements)	BCBL AWE Ranking (16 Information Types) - March	0.397	0.128

Observed and Perceived Frequency of Information Usage by Type

Information Element	Observed Frequency (Human)	Observed Frequency (Video)	Perceived Frequency (Relative)
Enemy Location	65	75	3.58
Enemy Activity	32	29	3
Enemy Strength	8	13	3.04
Enemy LOG Status	3	not recorded	0.88
Enemy Intent	38	29	3.23
Enemy Capabilities	21	9	2.88
Friendly Location	50	22	3.69
Friendly Activity	51	34	3.58
Friendly Strength	49	29	3.42
Friendly LOG Status	14	not recorded	2.08
Friendly Capabilities	50	42	3.35
Weather	4	4	2.08
Terrain	8	1	2.54

Frequency of Usage Statistics

Group 1	Group 2	Pearson ρ	p values
Data Collector	Student	0.819	0.001
Video-Recorded	Student	0.702	0.016
Data Collector	Video-Recorded	0.86	0.001

APPENDIX E.

Common Information Element Results

(The Top 26)

Information Element	Common Elements	BCE Ranking	CCIR Study Ranking
Command/G2 Guidance (PIR)	♦	1	11
Enemy Mission/Objective	♦	2	13
Enemy Situation/Assessment	♦	2	10
Area of Operations	♦	4	19
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